



Patent Application SN 09/764,031  
New Claims 11-26

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JUL 09 2002  
TC 1700

11. A process for production of a sintered oxide ceramic of composition  $Ce_xM_yD_zO_{2-a}$  with dense structure without open porosity or with a predetermined porosity comprising the steps of:

using a first doping element M selected from the group consisting of rare earths, but wherein  $M \neq Ce$ , alkali metals, earth alkali metals, and Ga;

using an educt with a second doping element D of at least one metal, but wherein  $D \neq M$ , selected from the group consisting of Cu, Co, Fe, Ni, and Mn wherein second doping element D is of submicron particle size or is a salt solution; and

sintering the educts at a temperature between 750-1200°C to form said oxide ceramic having a grain size no greater than 0.5  $\mu m$  and wherein the mol fractions used range from  $0.5 \leq x \leq 1$  for Ce,  $0 \leq y \leq 0.5$  for first doping element M, and  $0 < z \leq 0.05$  for second doping element D.

12. The process according to claim 11, characterized in that first doping material M is taken from the group La, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu; Ca, Sr, Ba; Sc, Y.

13. The process according to claim 11 wherein said mol fraction of  $z$  ranges from  $0.001 \leq z \leq 0.02$ .

14. The process according to claim 11 wherein said educts have a mean grain size not greater than  $0.1 \mu\text{m}$ .

15. The process according to claim 14 wherein said educts have a mean grain size range of  $0.01 - 0.05 \mu\text{m}$ .

16. The process according to claim 11 wherein said sintering is performed at a temperature in the range of  $800 - 1200^\circ$

17. The process according to claim 11 wherein said sintering is performed at a temperature in the range of  $850$  to  $1100^\circ\text{C}$ .

18. The process according to claim 11 comprising the additional steps of:

monitoring a temperature rise of said composition;  
interrupting said temperature rise at a determined temperature; and  
terminating the sintering.

19. The process according to claim 11 wherein sintering occurs at a heating rate in the range of 0.5 - 20°C/min.

20. The process according to claim 11 wherein sintering occurs at a heating rate in the range of 1 - 10°C/min.

21. The process according to claim 11 wherein sintering continues until a density of at least around 98% of the theoretically possible density is reached.

22. The process according to claim 11 wherein sintering continues until a density of at least around 99% of the theoretically possible density is reached.

23. The process according to claim 11 wherein said sintering comprises a holding time between 1-2 hours.

24. The process according to claim 11 wherein said sintering comprises a holding time of at least 0.25 hours.

25. The process according to claim 11 comprising the additional step of grounding said educts wet and/or dry and calcinated.

26. Process according to claim 1 characterized in that the  
educts are precipitated, filtered and calcinated jointly as  
inorganic salts.